COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturers : Dr. Rania Assem

Course : Electrical Machines I

Course Code: EE 321 **Marks : 40**

Date : 16 / 01 / 2016 **Time : 2 hours**

Final Exam

Answer ALL the Following Questions:

Q1 [10 marks] (C-3)

a- Use illustrative drawing to show the construction of a 2-pole dc machine. Your answer should include the location and function of the field poles, brushes, commutator and interpoles **(4 marks)**

b- A rotating reluctance machine of the form shown has a coil inductance that can be approximated by:

$$L(\theta) = 0.02 - 0.04 \cos 2\theta - 0.03 \cos 4\theta \ \text{H}.$$

A current of 5A (rms) at 50 Hz is passed through the coil. And the rotor is driven at a speed, which can be controlled, of ω_m rad/sec.

i. Find the value of the average torque when $\theta=45°$
ii. Find the values of of ω_m at which the machine can develop average torque.
iii. At each of the speeds obtained in part (a), determine the maximum value of the average torque and the maximum mechanical power output. **(6 marks)**

Q2 [10 marks] (A-28)

a- Compare between the internal and external characteristics of separately excited and series dc generator **(4 marks)**

b- A 50 kW, 250 V shunt generator has an armature and field winding resistances of 0.02 Ω and 150 Ω respectively. The friction, windage and core losses are 1500 W at full load. Calculate:

i. Load current
ii. Armature current
iii. Voltage regulation
iv. Efficiency **(6 marks)**

Members of course Examination Committee:	Signature:	Date:
Lecturer : Dr. Rania Assem		10/01/2016
Course Coordinator : Dr. Ahmed Kadry		10/01/2016
Head of Department : Prof. Hamdy Ashour		10/01/2016